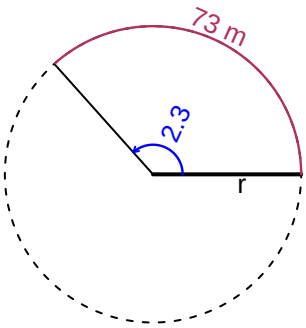
Name: Date:

Trig Final (SLTN v633)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.3 radians. The arc length is 73 meters. How long is the radius in meters?

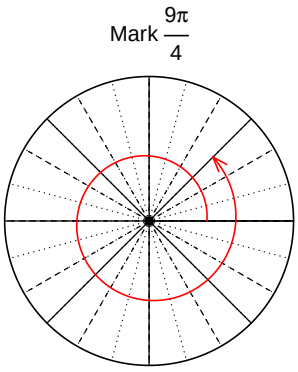


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

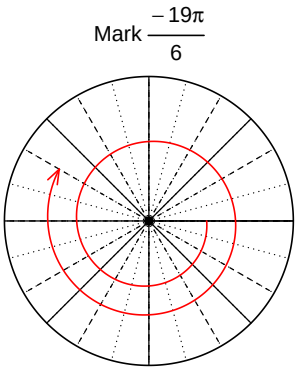
$r = 31.74$ meters.

Question 2

Consider angles $\frac{9\pi}{4}$ and $\frac{-19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{9\pi}{4}\right)$ and $\sin\left(\frac{-19\pi}{6}\right)$ by using a unit circle (provided separately).



Find cos(9π/4)



Find sin(−19π/6)

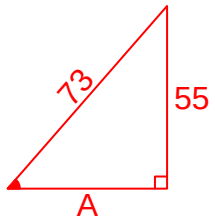
$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-19\pi/6) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{-55}{73}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

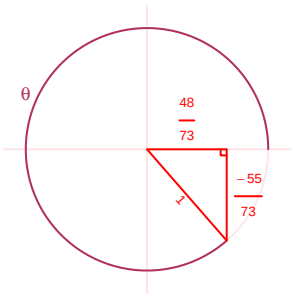
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 55^2 = 73^2$$
$$A = \sqrt{73^2 - 55^2}$$
$$A = 48$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-55}{73}}{\frac{48}{73}} = \frac{-55}{48}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 2.07 Hz, an amplitude of 8.84 meters, and a midline at $y = 3.88$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.84\cos(2\pi 2.07t) + 3.88$$

or

$$y = 8.84\cos(4.14\pi t) + 3.88$$

or

$$y = 8.84\cos(13.01t) + 3.88$$